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| Research Article

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Experimental Analysis of Seismic Performance of Buildings

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Annotation
The seismic protection measures currently used are ineffective, and the calculation and design of buildings and structures. According to current standards, it does not at all exclude their destruction. Critical analysis provided seismic protection of buildings and proposes basic principles for their improvement. (The measures of seismic protection applied nowadays are ineffective, calculation and design of buildings and constructions for existing rules doesn't exclude their destruction at all. The critical analysis of seismic protection of buildings is provided and the basic principles of their improvement are offered.)

Keywords: Earthquake, seismic protection, anti-resonance, microcracks, construction, crushing, destruction, buildings, structures.

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Introduction. Despite the high achievements and development of science in the field of earthquake-resistant construction, the problem of ensuring the seismic resistance of residential buildings is still a pressing problem in our life. For construction in rural regions of Uzbekistan, mud brick, adobe, adobe and soil blocks. As statistics show, buildings made of adobe are mostly common. Clay buildings are a structure made from unprocessed clay, which has a natural composition, moisture and no impurities [1]. To construct such buildings, almost no imported materials are required. These buildings are not built higher than two floors. They are used as office and residential buildings, stables, warehouses, utility rooms, repair shops, storerooms, cowsheds, etc. The longitudinal walls of adobe buildings should be tied with transverse walls at intervals of at least 10-12 cm to prevent wall collapse and ensure the stability of the walls. Clay buildings are not resistant to seismic vibrations. Based on the above, there is a practical need to study such houses in order to strengthen them from seismic influences and other natural phenomena. All seismic isolation systems are structurally implemented in the form of upper and lower support elements, between which the seismic isolation layer is mineral materials: sand, clay, etc., or synthetic materials with a low coefficient of friction, for example, ftoroplast [4]. Currently, there are various technical solutions of friction type support devices. However, only a few of them are used in research work and experimental construction. At the actual (real) design stage, all special seismic protection systems undergo significant changes. Additional devices are included in the construction to limit the work of seismoisolators at a low impact level, to increase the dispersion of vibration energy, etc. Due to the dry friction forces, the sliding-type seismic-

isolating base structures ensure a single kinematic connection of the building with the vibrating ground, until the total inertial force in the system exceeds a certain level - the activation limit, the value of which depends on the coefficient of friction and the configuration of the sliding surfaces of the foundation. Based on an analysis of many facts of seismic destruction of buildings, including those officially considered earthquake-resistant, unfortunately, we are forced to admit that currently used seismic protection measures are ineffective, and the calculation and design of buildings according to current standards does not at all exclude their destruction. In this regard, we note that in the building codes of some countries there is a very new, unusual progressive clause, which provides for the design of buildings for any other seismic impacts not yet officially provided [2].

Results and its discussion. A distinctive feature of the calculation of buildings with seismic insulating sliding belts is the reduction of calculated horizontal seismic loads. Until the seismic force on the ground structures of the building (on the sliding belt) exceeds the frictional forces on the sliding supports, it acts together with a single kinematic connection between the foundation of the building and its upper part. If the inertial force is greater than the sliding frictional force, the building starts to slide relative to the foundation. In order to limit the relative horizontal displacements of the building and the foundation and increase attenuation, elastic (for example, rubber-metal) and bikr (for example, reinforced concrete) constraints are introduced into the seismic protection system. To prevent separation of the building from the foundation, it is carried out with the help of elastic limiters of vertical displacements [3].

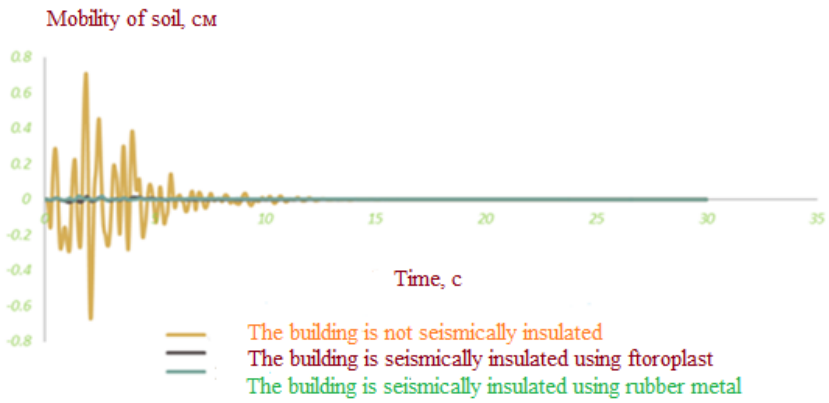
Accelerograms - a whole series of time dependence of ground accelerations are analyzed in the formation of initial data on seismic effects. In the selection of computational effects, the same was done with domestically censored accelerograms as with overseas instrumental recordings. Impacts were assessed by two categories (category): intensity and frequency composition of the earthquake. The impact of an earthquake, measured in points, is determined using different scales. In Russia, the MSK-64 scale is usually used. Therefore, after digitizing more than 100 accelerometers, impact options corresponding to 7 - 9 points in intensity according to the MSK-64 scale were considered. Dynamic calculations of the seismically isolated building model using Ftoroplast were carried out based on the EBROCOD program. Determination of displacements, velocities, accelerations, ground deformations and shear forces is done by solving a system of differential equations of vibrations. The program allows calculation of buildings of various structural systems and large-scale buildings, and data is entered depending on the number of floors. Complete information on the seismic response of the building is printed digitally and graphically. To increase the accuracy of calculation results, the program provides an opportunity to change the integration stage. In this program, the seismic response of 9-story seismically isolated and non-seismically isolated building models was studied. At the same time, options for semoisolation with rubber metal and semoisolation with the proposed ftoroplast material were considered. Seismic vibrations of soils were established in the form of artificial accelerograms with different vibration periods with maximum acceleration corresponding to point seismic effects. The seismic force was defined as:

$$S_i = m_i(\ddot{y}_i + \ddot{y}_{\text{гр}})\, i = 1 \div n \quad (1)$$

The elastic responses of the calculated cantilever model are defined as the product of the storey deformations with the stiffness coefficients of the system within the storeys.

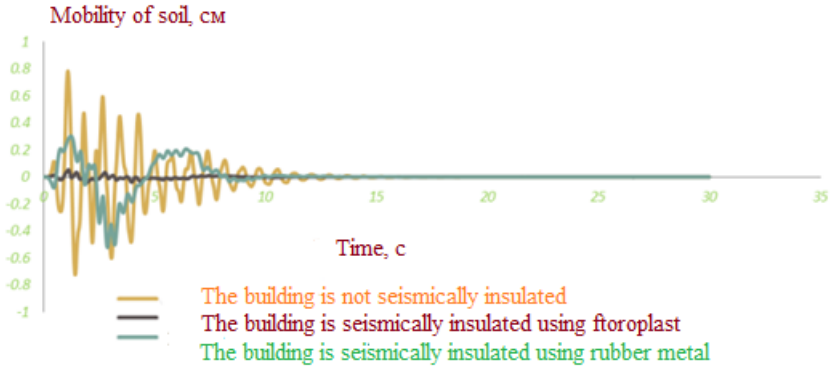
$$\mathrm{K}_i = k_i(y_i - y_{i-1})\, i = 1 \div n \quad (2)$$

The figure below shows graphs of top mass movements over time.



1 - picture. Comparison graph of accelerograms of a 9-story building model that is not seismically isolated and seismically isolated with the help of a sliding belt (experimentally determined accelerogram).

It can be seen from the graphs that displacements are significantly reduced in the proposed 9-story building models without seismic isolation and seismic isolation using rubber-metal.



2 - picture. Graphs of the dependence of damage on the walls of a 9-story building on the duration of seismic impact

Conclusion: The purpose of the experimental study is to determine the general laws of seismic vibrations of structures with seismic insulating sliding supports made of low-friction steel and fluoroplast, depending on the intensity of ground vibrations. In conclusion, the analysis of these results shows that compared to buildings without seismic isolation, seismic isolation using rubber metal, and seismic isolation using fluoroplast, vibrations, building distortions, ground inertia forces, and variable shear forces on the building floor are reduced by 1.35 to 2 times.

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